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U.S. Department of Transportation
National Highway Traffic Safety Administration

Memorandum

Date: MAR 18 1999

Subject: Submittal of Meeting Minutes of the MVSRAC/Event Data Recorder (EDR) Working Group to Docket No. NHTSA-99-5218-1

From: Raymond P. Owings, Ph.D.
Associate Administrator for
Research and Development

Reply to
Attn. of NRD-01

To: The Docket

THRU: Frank Seales, Jr.
Chief Counsel

Attached is the meeting minutes of the Motor Vehicle Safety Research Advisory Committee, Crashworthiness Subcommittee, Event Data Recorder (EDR) Working Group meeting held on October 2, 1998. The purpose of the meeting was to understand the status of EDR technology, review the needs for crash data, discuss privacy issues, and develop the working group.

Meeting history:

Meeting #	DATE
1	October 2, 1998

This working group is related to the following dockets:

NHTSA-98-3887: Crashworthiness Subcommitte
NHTSA-98-3928: MVSRAC Full Committee

Research and Development requests that the minutes of this meeting be placed in the public docket.

Attachments

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Event Data Recorder Working Group

October 2, 1998

Meeting #1

MVSRAC

Motor Vehicle Safety Research Advisory Committee

Crashworthiness Subcommittee

Motor Vehicle Safety Research Advisory Committee

Crashworthiness Subcommittee
Event Data Recorder Working Group
Meeting #1

Minutes
Friday, October 2, 1998
9:00 AM - 4:00 PM
NHTSA Headquarters
Washington, DC

The Event Data Recorder (EDR) Working Group consists of a panel of government and industry officials appointed by the Motor Vehicle Safety Research Advisory Committee's (MVSRAC) Crashworthiness Subcommittee. This first meeting of the EDR Working Group members and invited guests was held at the National Highway Traffic Safety Administration's (NHTSA) headquarters in Washington, DC. The purpose of the meeting was to: outline the objectives of the Working Group; understand the status of EDR technology; understand the needs for crash data; review privacy issues; and develop the working group. The meeting was chaired by Dr. Joseph Kanianthra, Director of NHTSA's Office of Vehicle Safety Research. The agenda for the meeting is included as Attachment 1.

1.0 Welcome, Introduction, and Meeting Objectives

The meeting was called to order by Dr. Joseph Kanianthra, Director for the Office of Vehicle Safety Research, NHTSA. Dr. Kanianthra welcomed everyone to the meeting and, for opening remarks, introduced Raymond P. Owings, Ph.D., Associate Administrator for the Office of Research and Development, NHTSA. Dr. Kanianthra stated he was testing a new idea of online/interactive minutes for this meeting and would provide all attendees a summary report along with attachments of all presentations, to be made available in the NHTSA Docket.

Dr. Owings discussed the role of the MVSRAC committee & its members. He also discussed the functions of NHTSA's National Center for Statistics and Analysis (NCSA) w.r.t. data collection, databases, etc. In conclusion, Dr. Owings thanked all for attending the initial Working Group meeting. A copy of Dr. Owings' slides are fond in Attachment 2

Dr. Kanianthra briefly discussed the agenda and announced that Charlie Gauthier would represent Blue Bird Body Company, a bus manufacturer, as well as NASDPTS.

2.0 Background and Overview of EDR's (See Attachments 3&4)

Dr. Kanianthra opened the discussion of NHTSA's EDR Working Group with discussion of the formation of WG via a request for nominations from MSVRAC Subcommittee. Dr. Kanianthra

provided a history of event recorders, including success stories with the Automatic Collision Notification (ACN). The agency is currently being petitioned to use EDR technology with airbags.

The technical objectives and benefits were stated to include the need to: 1) define EDR functional and performance requirements for onboard recorders, 2) understand present technology, 3) develop set of data definitions, and 4) discuss various uses of data-legal & privacy issues. Dr. Kanianthra continued to indicate that NHTSA foresees immediate use of the data. For example, to obtain crash pulses, airbag-related details, precrash data, etc.. (See Attachment 1). The Haddon matrix was discussed for crash conditions/scenarios with and without EDR technology. Various data issues were discussed, such as, sampling rate, filtering, downloading capability, types of devices, hardware/software needs, and validation of EDRs. Dr. Kanianthra briefly discussed potential areas of conflict with regard to data ownership.

Dr. Kanianthra discussed real-world crash analysis performed by NHTSA with the use of EDRs. He then invited comments and reactions from the WG. Comments received from attendees were related to the various data needs, such as, airbag related information, crash location accuracy <1000 meters, crash avoidance related info, etc. It was then recommended by attendees that the WG develop a list of data: 1) that are currently collected, 2) that could be collected near term based on technology, and 3) that can be collected long term (e.g. airbag inflation time, etc.). The WG should then prioritize the lists from steps 2 and 3.

A discussion ensued in which industry and government officials noted the importance of crash location in aiding emergency help. An attendee noted, with slight uncertainty, that commercial capability is up to 100 meters. There were some questions with respect to the accuracy of the GM OnStar System. It was also noted that the system could tie into theft notification.

Mr. Vernon Roberts, of National Transportation Safety Board (NTSB), discussed the recommendation of a plan to gather the crash pulses and various parameters. He noted that sensors could be used to collect crash pulses and precrash data, such as, ABS related info. He acknowledged the potential resistance from consumers of be monitored by "Big Brother," insurance companies, etc. Mr. Roberts continued his discussion and provided a handout entitled, *Information for Transportation Safety Sharing the Knowledge.* He indicated that the goal is to share the knowledge and experience gained from the use of recorded information to improve transportation safety and efficiency. A public meeting/symposium is tentatively scheduled for the 1" week in MAY 1999. Information regarding the meeting is presented in Attachment 5.

BREAK

Upon the return from the break, a discussion was opened by attendees regarding the precrash list presented by Dr. Kanianthra (See Attachment 3). Attendees were interested in a detailed discussion on specific data elements that should and/or could be collected. Dr. Kanianthra recommended that the discussion be held after the manufacturer's presented information related

to current EDR use and technology.

3.0 Manufacturer Discussion of EDR Technology

3.1 Robert Cameron, VW

Mr. Robert Cameron, of Volkswagen, discussed EDR technology and VW's European experience. Mr. Cameron indicated that the European Community is reluctant to install any recorded vehicle information that is accessed beyond the consumer. He noted that the public does not want information to be available [to insurance companies, manufacturers, etc.]. Mr. Cameron noted that data collection stop after the airbag "fires." There was indication of upcoming technological systems to address occupant detection. Some technology will be available in two years. VW will phase-in technology starting with top models. Mr. Cameron stated that EDR should be mandated due to legality issues and to allow all to have equal access. He noted that, without a mandate, consumers may decide to purchase non-EDR equipped vehicles.
Mr. Cameron received questions from attendees with respect to currently collected data. Current collected data are: air bag status (128 msec of data), voltage across fire pin, timing sequence, belt status, and ABS sensor (only checks for system faults). Mr. Cameron reiterated the need for NHTSA to mandate EDR and develop standards-keeping in mind the 2-year lag time.

3.2 Brian Shaklik, Navistar

Mr. Brian Shaklik of Navistar indicated that Navistar has no experience with EDRs. He noted that, in hopes of determining the best direction to proceed, Navistar would like to take the lead from the WG. Mr. Shaklik received a question soliciting his opinion of potential driving forces (i.e. industry, consumers, etc.). Potentially, the fleet will be the driving force. He cautioned there is potential for resistance from consumers.

3.3 Thomas Mercer, GM

Mr. Thomas Mercer of General Motors discussed airbag sensing and diagnostic module functions (see Attachment 6) GM's Event Data Recorder research. Upon completion of Mr. Mercer's presentation he commented on the work NHTSA is doing with Automatic Collision Notification systems, (ACN) and the possible benefits that could be obtained from this data to help EMS personnel work better. Questions were taken by Mr. Mercer relating to current data element collection, complexity level of collecting CA data, etc..

In conclusion, Mr. Mercer noted the need to prioritize the most important collection items due to power storage issues. He sited an investigation in which data collection had ceased after the battery was damaged. He noted that GM is currently trying to determine what data items to collect (last page handout). GM is looking at several items based on all sensors available on existing vehicles.

3.4 Dave Bauch, Ford

Mr. Bauch of Ford discussed event recording and difficulties in getting data back from crashes. Mr. Bauch emphasized Ford's desire for engineering data retrieval, but has not been successful.

He raised the issues of data storage due to large data collection. Mr. Bauch did not have a handout to share with the WG at this time. He is reviewing the material within Ford for determination of public release.

3.5 Kathy Gravino, Chrysler
Ms. Gravino of Chrysler discussed the current and future Event Data *Status* (See Attachment 7). Ms. Gravino also discussed the development & issues surrounding Event Data Recorders.

3.6 Charles Gauthier, representing Blue Bird Bus
Mr. Gauthier indicated that bus manufacturers do not have experience with EDR technology. Bus manufacturers have not been investigating EDR technology. Mr. Gauthier noted that bus manufacturers believe that they are the best fleet for testing the technology.

A discussion ensued with regards to the use of EDR technology in Europe. It was noted that some European school buses are equipped with EDR. And, that there are claims of a 40-50% crash reduction due to the driver's awareness of the device. An inquiry was posed to the group with regards to the availability of EDRs as an aftermarket device. It was noted that self-contained, aftermarket EDRs are currently available in the U.S. Typically, the device is uses for parental monitoring of teenage driving behavior. One attendee acknowledged a current personal development of an aftermarket device.

LUNCH BREAK

4.0 Discussion of the Need for Crash Data:

4.1 ***Government Needs***

4.1.1 Martin Hargrave, FHWA
Mr. Martin Hargrave, FHWA, discussed safety related issues with respect to data collection. Attachment 8 represents a draft list of requirements, noting specific elements currently collected in GM vehicles. Mr. Hargrave noted that the data would be used to help design safer roadways. He indicated FHWA's strong interest in collecting steering input, but emphasized *crash location* as the most significant data element. Mr. Hargrave addressed a questions from an attendee inquiring as to whether FHWA run tests with dummies. Another attendee commented that maybe manufacturers should be testing to FHWA's "hardware" tests. (Tests are outlined in NCHRP 350 which is available through TRB[1].)

4.1.2 Ken Opiela, TRB
Mr. Ken Opiela discussed the role of TRB as providing independent, unbiased technical advice. Mr. Opiela noted TRB's experience and involvement in various cooperative research programs. He focused his discussion on a list of potential data elements and safety research uses of EDR

[1] Can be ordered at http://www2.nas.edu/trbbooks/377e_36e.html

(See Attachment 9).

4.2 Industry Needs

Mr. Charles Gauthier reiterated manufacturers experience **&** recommendation (See Section 3.6). Mr. Gauthier also posed a general question to the group as to whether the EDR will be a monitoring device or only used for crash data? It was determined that the issue would have to be addressed at a later time.

4.3 ***Other Research Needs***

4.3.1 Kowalick, Independent Researcher

Mr. Kowalick discussed his experience, involvement and interest in **EDR's**. Due to attendees inquiries, the discussion focused mainly on issues related to aftermarket **EDRs**. A discussion ensued in which positive aspects of EDR were expressed. For example, an aftermarket EDR can provide data, such as, crash location, time of crash, velocity, direction, use of future GPS technology, etc. Providing an aftermarket EDR device allows the consumer a choice.
Mr. Kowalick currently has a prototype and **FOTs** underway. Mr. Kowalick did not have a handout at this time.

4.3.2 Greg Shaw, UVA

Mr. Greg Shaw noted that UVA is working on small version EDR.

4.3.3 Jeya Padmanaban, JP Research

Ms. Jeya Padmanaban emphasized specific research needs with respect to EDR data elements.

5.0 Discussion on Privacy Issues:

Sharon Vaugh, NCC:

1. Data ownership must be determined by group; will probably require verbiage in vehicle sales contract indicating who can access data
2. EDR situation can be construed as an easement type scenario. One party owns but another party has an interest/requirement for data
3. Need to determine the use of data: 1) only research purpose, **&/or 2)** for ODI enforcement
4. Next, need to address sharing issues:
   Law Enforce can download data *based on statutes,* but only for crash reconstruction. Cannot use occupants "physical state" type info.

A detailed discussion ensued in which attendees described various scenarios that required definition of ownership. Ms. Vaugh provided an example of a legal agreement reached between FAA and the airline industry on **EDRs/Blackboxes**. Ms. Vaugh noted the difference in ownership issues, in that, the airlines still owned the planes although used by "consumers." Therefore the Box still belongs to the airline. The agreement allowed FAA access to the information purely for

research purposes. The Judiciary branch of FAA was not allowed access to any of the data/findings. Ultimately, the information could not be used to file charges or bring investigation against an airline.

6.0 Working Group Activities

6.1 Meeting Co-Chair for next meeting: Vernon Roberts (Thanks from the WG)

6.2 Next Meeting: Feb 17, 1999, Washington DC

6.3 Work assignments/action items

6.3.1 Data Elements

The working group spent a large segment of meeting one discussing data elements along with the priority and purpose of each. It was clear that different members had different needs for data. The WG decided that a poll should be taken to obtain a clearer view of the data elements required for different research purposes. NHTSA agreed to develop a form and circulate it to all members wit-in a few weeks of the meeting. Each member would fill out the form, providing priorities , time requirements, and purpose for the data elements required for their mission. Additionally, it was agreed that all forms would be shared with all members prior to the Feb 99 meeting. The data form is attached to the minutes. Please provide your inputs by January 1, 1999. NHTSA will provide copies of all forms to the WG, for discussion at the Feb 99 meeting.

6.3.2 Ownership/Privacy

The discussion of data ownership was very lively. It centered around a discussion led by Ms. Vaughn, and was intertwined with the different requirements associated with different elements data. In an effort to allow everyone to express thereself, it was agreed that each member would help develop issue papers to address Industry, Government,, and Other Research Issues w.r.t. ownership/privacy by November 3 1, 1998[2]. The lead for these papers are as follows:

Industry: Each Manufacturer would submit their own issue paper
Government : Hargrave
Other Research: Kowalick

Other members should coordinate their response with the lead person.

6.3.3 Mission Statement

NHTSA is to provide a draft work plan, which will include a mission statement. The work plan is to cover goals and objectives, a list of tasks, and a time line for completing this WG effort. NHTSA will develop a straw-man work plan, which will be circulated about 4 weeks prior to the Feb 99 meeting.

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[2] The original data was November 1, 1998.

Attachments

1 Agenda
2 Dr. Owings' presentation slides
3 Dr. Kanianthra's presentation slides
4 Introduction to EDRs
5 NTSB Public Meeting Notice (draft)
6 GM's handout
7 Chrysler's handout
8 FHWA's handout
9 TRB's handout
10 Attendance list and Updated Working Group Member list

Data Form Instructions

EDR Working Group Members,

On the following pages, you will find the data form. It is a compilation of all the suggested data elements that I have received from interested parties. I realize this list is vast, and current and next-generation event data records will not collect most of these data elements. I have included them all, and it will be the job of the WG to develop a final list.

The following are the instructions for the 4 columns in the data form:
Priority: List the priority you place on the data element. You can use Hi, Med, Low scale, or number 1 through n, with 1 being the highest priority.
Data Element: There are a few empty boxes at the end for additional elements.
When Possible:
For manufacturers - list when this technology will be available, using Near term (current of within 6 mo), Short term (within 3 years), and Long term (more than 3 years);
For others, list when this technology will be needed, using the same scale.
Purpose: Describe the purpose of the data element, using short descriptive phrases.

You can fill in the form electronically and transmit via e-mail (e-mail me a request and I will forward a copy of the blank form) or just fill in the form and mail or fax it in. The forms are due January 1, 1999. I will summarize the data and distribute the summary prior to the February 17, 1999 meeting.

Confidential data must not be submitted to me. You must use NHTSA's established procedures to protect confidential business information.

John Hinch

DATA FORM			
PRIORITY	**DATA ELEMENT**	**WHEN POSSIBLE**	**PURPOSE**
	Active suspension measurements		
	Advanced systems		
	Air bag inflation time (time from start of crash to start of air bag inflation)		
	Air bag status		
	Air Bag on/off switch position		
	Automatic collision notification		
	Battery Voltage		
	Belt status - each passenger		
	Brake status - service		
	Brake status - ABS		
	Collision avoidance, braking, steering, etc		
	Crash pulse - longitudinal		
	Crash pulse - lateral		
	CSS presence indicator		
	Delta-V - longitudinal		
	Delta-V - lateral		
	Electronic compass heading		
	Engine throttle status		

DATA FORM			
PRIORITY	**DATA ELEMENT**	**WHEN POSSIBLE**	**PURPOSE**
	Engine RPM		
	Environment - ice		
	Environment - wet		
	Environment - temp		
	Environment - lumination		
	Environment - other		
	Fuel level		
	Lamp status		
	Location - GPS data		
	Number of occupants		
	Principal Direction of Force		
	PRNDL position		
	Roll angle		
	Seat position		
	Stability control		
	Steering wheel angle		
	Steering wheel tilt position		
	Steering wheel rate		
	Time/date		
	Traction Control		
	Traction coefficient (estimated from ABS computer)		
	Transmission selection		

DATA FORM

PRIORITY	DATA ELEMENT	WHEN POSSIBLE	PURPOSE
	Turn signal operation		
	Vehicle milage		
	Vehicle speed		
	VIN		
	Wheel speeds		
	Windshield wiper status		
	Yaw rate		

AGENDA

Event Data Recorder Meeting #1

9:00 a.m. - 4:00 p.m. ***Friday - October 2, 1998***

Room ***4236 NASSIF Building; 400 7th Street S. W.***

Washington DC 20590

Working Group Objective

Facilitate the collection & utilization of collision avoidance and crashworthiness data from on-board EDRs.

Meeting Objective

The first meeting has several objectives: 1) Understand the status of EDR technology; 2) understand the needs for crash data; 3) review the privacy issues; and 4) develop the working group.

Opening Remarks (Ray Owings) 9:00-9:15

Welcome and Introductions (Joe Kanianthra) 9:15-9:30

Background

NHTSA (Joseph Kanianthra) 9:30-10:30

- Structure of meetings and WG (full & sub- committees & WGs)
- Membership selection
- Minutes (Linda McCray)
- Reporting the work to full committee
- Docketing (public information)
- History and recent activities regarding EDRs (presentation)

NTSB (Vem Roberts) 10:30-10:45

Break 10:45-11:00

Manufacturer discussion of EDR technology (10 min each group) 11:00-12:00

- VW
- Navistar
- GM
- Ford
- Chrysler
- Blue Bird

Lunch 12:00-1:00

Discussion of the Need for Crash Data (15 min each group) 1:00-1:45

- Government needs (Martin Hargrave & Ken Opiela & Ray Peck)
- Industry needs (Charlie Gauthier w/ manufacturer's inputs/needs)
- Other research needs (Tom Kowalick & Greg Shaw & Jeya Padmanaban)

Discussion on privacy Issues 1:45-2:15

- Sharon Vaughn
- Other interested parties

Break 2:15-2:30

EVENT DATA RECORDERS

Sept 10, 98

1.0 Introduction

Event Data Recorders (EDR) have been used for many years to record crash related metrics, including the crash deceleration of the vehicle. Early efforts conducted by NHTSA included a device, circa 1970s, which used analog signal processing and recording devices to process and store the crash data. This recorder was known as the Disc Recorder, and was installed in about 1,000 vehicles in several fleets. During 1973 and early 1974, the fleet equipped with these recorders accumulated about 26 million miles. During that time, 23 crashes were analyzed, which included delta Vs up to about 20 mph. Actual deceleration-time histories were collected.[1] These devices were expensive to manufacture, and because installation of these recorders in a vehicle was a prerequisite to collection of crash data, data were limited to a few crashes.

NHTSA's Intelligent Vehicle Initiative (IVI) program, a subprogram of FHWA's Intelligent Transportation System (ITS) has developed a data recorder for post-production installation on vehicles, known as the Automated Collision Notification (ACN). It is a prototype "Mayday" system for passenger vehicles that automatically and reliably detects the occurrence of a crash and alerts Emergency Medical Services (EMS), Police, and Fire agencies. The primary objective of the system is to significantly reduce emergency response times for personal injury crashes by automatically assembling and transmitting a cell phone message from the car to local emergency agencies with the vehicle location and crash severity data. The system measures crash deceleration data and stores it for transmission through the cell link. To date, about 600 units have been installed in volunteer's vehicles in a pilot study of the ACN in the Buffalo, NY area. These units have been involved in about 10 crashes of various severity.[2]

2.0 Background

With the introduction of air bags, vehicles need a crash analyzer to determine if the air bag should be deployed. Early air bag controllers were analog devices, performing the decision process based on pre-programed crash characteristics of the vehicle. As these devices are improved, electronic analyzers are introduced. The electronic devices analyze the deceleration pulse to determine if the air bag should be deployed. As these electronic devices evolved, manufacturers installed electronic memories capable of storing information on the system. As this capability grew, manufacturers enhanced the system to store some crash characteristics, such as deceleration and delta-V. Further enhancements have included storage of pre-crash data, including vehicle speed, brake status, etc. Current EDR systems are considered to be early generation systems with ernormus potential for

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[1] Teel, Stephen, Peirce, Steven, and Lutkefelder; *Automotive Recorder Research - A Summary of Accident Data and Test Results;* NHTSA; 1974

[2] See the NHTSA web page at http://www-nrd.nhtsa.dot.gov/summaries/ITS_13.htm and the Calspan web page at http://www.calspan.com/mayday.html

collecting and using pre-crash, crash, and post crash data.

There are other recording devices on the market. These devices are sold in the aftermarket, for owners to install in their vehicle. Some of these devices analyze the vehicle's deceleration to determine if the vehicle has been in a crash. Depending on the crash severity, these devices can summon help via cell phone technology. Several manufacturers offer similar equipment as original equipment on their vehicles, such as the Cadillac On Star and Ford Rescue systems.

EDRs have gained great interest in the recent time. Within the past year, activity on this issue has increased at NHTSA.

2.1 NTSB

In 1997, the National Transportation Safety Board (NTSB) issued recommendations to NHTSA, based partly on public hearing held on March 17-20, 1997, Public Forum on Air Bags and Child Passenger Safety, indicating that NHTSA should pursue crash information gathering using EDRs. In a safety recommendation letter to NHTSA on July 1, 1997, NTSB recommended:

> "Develop and implement, in conjunction with the domestic and international manufactures, a plan to gather better information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented sensing and recording devices.(H-97-18)"

In NHTSA's response to the safety board, it indicated that it was currently obtaining data from EDRs through the cooperation of the manufacturer, for use in crash investigations. This cooperation is needed since the technology to "download" data from these devices is only available to the manufacturer.

NTSB added the EDR recommendation on its "10 Most Wanted List" in May 1997.[3]

The current status of the NTSB recommendation to NHTSA is:

H-97- 18 Open—Unacceptable[4]

Currently, NTSB is reviewing NHTSA's activities in this area to determine if the status should be changed to Open—Acceptable.

2.2 Petition for Rulemaking

NHTSA's Office of Safety Performance Standards (NPS) is currently evaluating a petition for rulemaking which requests the government to require EDR technology on all new passenger vehicles. The petitioner cited a crash, where family members were fatally injured, that, in his opinion, this technology could have provided evidence that would have been valuable in determining the crash

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[3] See NTSB web page at http://www.ntsb.gov/Recs/history.htm#Original

[4] See NTSB web site: http://www.ntsb.gov/recs/recording%5Fdevice.htm

scenario. An agency decision is expected in the near future.

2.3 JPL Report

In 1997, NHTSA, under a joint agreement with National Aeronautics and Space Administration's (NASA) Jet Propulsion Laboratory (JPL) and NHTSA, contracted with JPL to

> "evaluate air bag performance, establish the technological potential for improved air bag systems, and identify key expertise and technology within NASA that can potentially contribute significantly to the improved effectiveness of air bags."

In the final report on this project[5], JPL recommended that NHTSA investigate EDRs, stating in recommendation number (6):

> "Study the feasibility of installing and obtaining crash data for safety analyses from crash recorders on vehicles. Crash recorders exist already on some vehicles with electronic air bag sensors, but the data recorded are determined by the OEMs. These recorders could be the basis for an evolving data-recording capability that could be expanded to serve other purposes, such as in emergency rescues, where their information could be combined with occupant smart keys to provide critical crash and personal data to paramedics. The questions of data ownership and data protection would have to be resolved, however. Where data ownership concerns arise, consultation with experts in the aviation community regarding the use of aircraft flight recorder data is recommended."

2.4 Manufacturer Activity

2.4.1 GM

For the past several years, General Motors (GM) has been installing electronic air bag sensors in its vehicles. These electronic sensors have the capability to store some crash information. The main items stored in the EDR, which is incorporated in the vehicle's air bag sensor, e.g., GM's Sensing Diagnostic Module (SDM), are the vehicle's longitudinal velocity change versus time, the time the air bag was deployed after the beginning of the crash, and driver belt switch status.

GM has recently designed an improved generation of EDRs, with the capability of storing additional information related to the pre crash event. These new systems record the vehicle's speed, engine speed, brake switch status, and throttle opening. These data are recorded for about 5 seconds prior to the crash, in one second intervals. During the crash, the vehicle's longitudinal velocity change is measured for 0.150 seconds after the start of the crash, in 0.010 second intervals. GM started installing these expanded devices in MY 1998 vehicles. By the completion of MY 2001, GM expects these devices to be installed in over 3 million GM vehicles. Based on estimated sales and crash involvements, GM is estimating that about 28,000 crashes where crash data will have been recorded

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[5] Phen, Dowdy, Ebbeler, Kim, Moore, and VanZandt; *Advanced Air Bag Technology Assessment;* JPL Publication 98-3; April 1998. The report can be found on the JPL web sight - http://csmt.jpl.nasa.gov/airbag/contents.html

in the EDR will have occurred, increasing at the rate of about 20,000 per year

GM is currently in the process of manufacturing systems for sale to the general public which can be used to read the stored data in the EDR. The systems will most likely require the use of a lap top computer to down load the data.

2.4.2 Ford

Ford Motor Company started installing a crash recorder in one model in MY97. For MY 1998, other models have been equipped with these devices.

2.5 NHTSA/FHWA/NTSB/TRB/GM Meeting

On April 1, 1998, NHTSA held a meeting between invited interested parties. The following purpose was defined for this meeting:

> Explore the possibility of establishing a committee to facilitate the collection and utilization of crash avoidance and crashworthiness data from on-board event data recorders.

Table 1 lists the participants of this meeting.

Table 1. Participant List for NHTSA's April 1, 1998, EDR Meeting

Name	Company	Phone
Art Carter	NHTSA-R&D	202 366-5669
Chip Chidester	NHTSA-R&D	202 366-5393
Heidi Coleman	NHTSA-NCC	202 366-1834
Richard Compton	NHTSA-NTS	202 366-9591
Martin Hargrave	FHWA	703 285-2508
Jack Haviland	GM	810 986-8759
John Hinch	NHTSA-R&D	202 366-5 195
Richard Humphrey	GM	202 775-5071
Joseph Kanianthra	NHTSA-R&D	202 366-4725
Tom Mercer	GM	810 986-3552
Ken Opiela	TRB	202 334-3237
Ray Owings	NHTSA-R&D	202 366-1537
Vernon Roberts	NTSB	202 3 14-6483
Ken Rutland	NHTSA-R&D	202 493-0055
Keith Schultz	GM	313 556-6024
Lori Summers	NHTSA-R&D	202 366-6734
Sharon Vaughn	NHTSA-NCC	202 366-1834

Presentations were made by NHTSA and GM. Position statements were made by NTSB, FHWA,

and TRB personnel. NTSB provided a history of the EDR technology, and discussed the Safety Board's recommendation. The Highway community, represented by the TRB and FHWA, expressed interest in collection of crash data for crashes into roadside safety devices. TRB is considering funding an initiative to look into using EDRs to define vehicle crash characteristics for roadside hardware.

The outcome of the meeting was an agreement that a committee should be formed. Several possibilities were discussed, including forming a "Blue Ribbon" panel, setting up a group through SAE, and forming a working group within the Motor Vehicle Safety Research Advisory Committee (MVSRAC).

2.6 MVSRAC Meeting

On April 29, 1998, NHTSA staff presented a briefing to the MVSRAC full committee to seek their approval in forming a working group for the EDR under the Crashworthiness Subcommittee. The purpose of the presentation was to recommend that a working group be formed under the Crashworthiness subcommittee. There was some discussion after the presentation, indicating that it would be several years before such devices would be wide spread enough to give researchers information on crashes. Also, MVSRAC members indicated that some manufacturers were not as far along in the EDR technology as GM. There were no objections expressed by the MVSRAC members present, and it was decided that the working group will be formed under the MVSRAC Crashworthiness Subcommittee.

In May 1998, NHTSA sent letters to the MVSRAC members and Crashworthiness subcommittee members requesting nominations for this working group. Eight members were nominated. In response to a second request sent out in August 1998, several additional nominations were received. The final member list is comprised of the MVSRAC member nominations and additional members selected by NHTSA. John Hinch was appointed working group chair.

The first meeting will be held on October 2, 1998, at the DOT headquarters building in Washington, D.C.

3.0 Analysis of EDRs in Real World Crashes

The NRD Special Crash Investigations (SCI) teams use EDR data in many of their crash investigations. EDR data were read by the manufacturer and the manufacturer's reports were placed in the SCI reports. Since the EDR technology is very new and not employed by all manufacturers, there are not many SCI cases with EDR data. Of those, most are still under investigation and their reports have not been made public. Only complete files are public.

3.1 SCI Case IN9618

In this case, two vehicles impacted head on. One vehicle was equipped with an EDR. The manufacturer downloaded the information from the EDR and presented it to the SCI investigator. The data were included in the report. The recorder provided the investigator with the information presented in Table 2.

Table 2. Crash recorder data from case IN9618	
Data	Result
Ignition cycle crash occurred in	3790 cycles
Driver belt status	Not fastened
Vehicle's maximum delta-v and time occurred	24 mph @ 0.150 sec
Time of deployment	0.03375 sec after start of crash*
* Start of crash is the time the vehicle experiences a 2g deceleration level	

The SCI investigator used the SMASH reconstruction program, damage only algorithm, to determine the delta V's for the case vehicle (the one equipped with the EDR). The Total, Longitudinal, and Lateral Delta Vs are, respectively: 12 mph, - 11 mph, and 3mph.

The SCI investigator felt the the EDR produced a Delta V for the crash which was closer that that of the reconstruction program.

3.2 SCI Case TRC/IU 9629

This case was a two vehicle frontal crash. The EDR data was downloaded and reported in the case file, as shown in table 3.

Table 3. Crash recorder data from case TRC/IU 9629	
Data	Result
Ignition cycle crash occurred in	2218 cycles
Driver belt status	Fastened
Vehicle's maximum delta-v and time occurred	8.9 mph @ 0.150 sec
Time of deployment	0.0325 sec after start of crash*
* Start of crash is the time the vehicle experiences a 2g deceleration level	

The SMASH reconstruction program, damage only program, predicted the vehicle's delta-V to be 14.0 mph total, -14 mph longitudinal, and 2 mph lateral.

4.0 Analysis of EDRs in NHTSA's NCAP and 208 Tests

NHTSA routinely conducts tests of new vehicles as part of our NCAP and compliance programs. During the 1998 MY test program, several GM vehicles were tested. The air bag SDMs were removed from these vehicles and the EDRs will be read to determine the DeltaV and crash pulse shape for each of these tests. These data were then compared to the data collected during the conduct of the crash tests. This effort should be completed prior to the first meeting, and a report will be presented.

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